

**COURSE DATA****Data Subject**

<b>Code</b>	35883
<b>Name</b>	Financial mathematics
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	6.0
<b>Academic year</b>	2021 - 2022

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
1314 - Degree in International Business	Faculty of Economics	1	Second term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1314 - Degree in International Business	7 - Financial mathematics	Obligatory

**Coordination**

<b>Name</b>	<b>Department</b>
DEVESA CARPIO, MARIA DEL MAR	113 - Financial and Actuarial Economics

**SUMMARY**

The principal aim of this course is to provide students with a solid and generic framework to analyze complex financial transactions. On completion of this course the student should be able to quantify the financial variables in any particular transaction and take the appropriate decisions based on the measurement of the cost and return on the transaction for the borrower and the lender, respectively.

This generic aim can be expressed through the following particular goals:

- To obtain an overview of the scope of Financial Mathematics.
- To master the fundamental concepts of Financial Mathematics.
- To accurately apply the standard valuation model in financial mathematics for the analysis of the most usual financial transactions.
- To develop skills to be applied in the analysis of new financial transactions that could come out in the financial markets.



## PREVIOUS KNOWLEDGE

### Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

### Other requirements

No prior knowledge is required

## OUTCOMES

### 1314 - Degree in International Business

- Develop the capacity to evaluate and critically analyse international economic phenomena and agents.
- Be able to work in multidisciplinary and intercultural teams.
- Utilizar rigurosamente el lenguaje matemático y el razonamiento lógico-deductivo en la formulación de problemas financieros.
- Aprender a razonar de una forma rigurosa y sistemática, adoptando una actitud emprendedora para la solución de nuevos problemas complejos.
- Emplear un marco común para el análisis de las operaciones financieras de inversión y de financiación.

## LEARNING OUTCOMES

- Obtain an overview of the scope of Financial Mathematics.
- Analyze and describe financial transactions by using a mathematical model and to quantify the financial variables that exist in any particular financial transaction.
- Have basic knowledge of the fundamentals of Financial Mathematics in order to apply them to solve any new transaction that could come out in the financial markets.
- Use appropriately the financial functions of a spreadsheet (Excel).
- Interpret accurately information about financial transactions in different contexts (asset issuances, financial regulation, financial institutions' brochures, etc.).

## DESCRIPTION OF CONTENTS

### 1. Fundamentals

1.1 Introduction.

1.2 Simple interest and simple discount.



## **2. Theory of compound interest**

- 2.1 Compound interest rule.
- 2.2 Accumulation and discount factors.
- 2.3 Effective and Nominal interest rates.

## **3. Financial value of payments: introduction to annuities**

- 3.1 Financial value of a set of payments. Financial addition.
- 3.2 Annuities. Financial value of an annuity.
- 3.3 Valuing constant annuities.
- 3.4 Valuing varying annuities in geometric progression.

## **4. Complex annuities**

- 4.1 Valuing annuities payable monthly.
- 4.2 Other complex annuities.

## **5. Financial transaction: financial equivalence and outstanding balance**

- 5.1 Definition and classification.
- 5.2 General approach.
- 5.3 Outstanding balance. Concept, calculation methods and evolution.

## **6. Cost and return: effective rates**

- 6.1 Effective rate of a pure financial transaction.
- 6.2 Effective rate of a financial transaction with additional terms and conditions.
- 6.3 A.P.R. (T.A.E in the Spanish case).

## **7. Amortization of a debt: general analysis**

- 7.1 Definition.
- 7.2 Financial equivalence.
- 7.3 Outstanding balance.
- 7.4 Total payment decomposition.
- 7.5 Other variables and relationships.
- 7.6 Dynamics of the main variables. Amortization schedule.

**8. Loans with predetermined rates**

- 8.1 Bullet loan.
- 8.2 Level-payment fixed-rate loan.
- 8.3 Constant principal repayments loan.
- 8.4 Other loans: loans with fractional interest payments.

**9. Adjustable-rate loans**

- 9.1 Adjustable-rate amortization transactions
- 9.2 Adjustable-rate loans.
- 9.3 Other adjustable-rate loans with fixed term: known principal repayments.

**10. Bonds**

- 10.1 Bonds issue: concept and types.
- 10.2 Financial analysis of a bond.
- 10.3 Rate of return.
- 10.4 Bond's market value.

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Computer classroom practice	15,00	100
Classroom practices	15,00	100
Development of group work	15,00	0
Development of individual work	15,00	0
Study and independent work	40,00	0
Preparing lectures	20,00	0
<b>TOTAL</b>	<b>150,00</b>	

**TEACHING METHODOLOGY**

There will be a **two-hour lecture plus a two-hour practice session per week**, one of them with computer in laboratory, thus totaling four classroom hours per week.

For the lectures, students should previously read the notes available in the course's **virtual classroom** ([www.aulavirtual.uv.es](http://www.aulavirtual.uv.es)) and the required text included in the bibliography. After the reading, students should write down the main doubts/questions arisen in the interpretation of the material. The lecturer will combine during the lecture his/her explanations with the active participation of students (they should raise their doubts and participate in discussions in group about the most controversial concepts). The objective is to improve the autonomous capacity of the students (individual work at home previous to the lecture)



as well as their ability to work in groups, to argue and defend ideas (debate groups), and their oral and written communication skills.

Practice sessions will be carried out combining different strategies, such as: solving exercises, working on case studies, developing workshops, presentations and/or discussions, etc. In example classes, on the one hand, the lecturer will solve standard problems in the classroom in order for students to learn to identify the key aspects of the corresponding approach in each unit. On the other hand, students will have to solve analogous problems, individually or in group. Solving problems in the computer lab will be addressed following an analogous scheme; students will have to work out problems which are similar to the ones solved previously by the lecturer.

Lecture slides and practice sessions guidelines and relevant materials will be uploaded onto the course's **virtual classroom** ([www.aulavirtual.uv.es](http://www.aulavirtual.uv.es)).

Students are encouraged to participate actively in all classes, including lectures. Should the students have any course-related queries, they are encouraged to take advantage of the (voluntary) office tutorials during the lecturer's office hours.

**Finally, some Classroom Rules and other practical points are provided:**

**A) Behavior in the classroom:**

- 1.-Please arrive on time to the lectures. Except in special circumstances, previously agreed with the instructor, no person is allowed in the classroom after the beginning of the class.
- 2.-Cell phones **MUST** always **BE** turned off. You should be able to pry yourself away from your cell phone during lectures – absolutely no texting. It is disruptive to the instructor and to your fellow classmates.
- 3.-Please refrain from talking to neighbors during lecture as well. Any student asked to leave the classroom or reproved because no observance of this rules could get negative points.

**B) Cheating and plagiarism**

- 4.-Cheating on an exam or plagiarizing the written work of others is considered a very serious offense and will not be tolerated in this course. Plagiarism exists not only when the paragraphs are identical to the ones found in another text but also when the structure is the same.
- 5.-In addition a report will be send to the Course and Grade coordinators. So, it is very important to avoid putting yourself in the position of even being suspected of cheating (e.g., looking at another student's exam or copying homework) or plagiarism (i.e., using another's words as your own written words), as the serious consequences may result. Bear in mind that the UV has software programs to automatically detect plagiarism.

**C) Office Hours**

- 6.-Office hours schedule is established to help students to solve all the doubts they could have for the best preparation of the Course.





7.-To favor less waiting times it is better to request an appointment by e-mail since those students will have preference.

8.-Do not expect an answer to an email with points explained in the course guide or in a general email sent to all students.

9. - By default emails do not identify the sender. To receive an answer, or consider the homework sent with it, you must write in the topic line: your complete name, the Practical group you belongs to and the reason or task sent. The same applies to homework sent as attachments. No attention will be given to emails without all this information.

## EVALUATION

The course grade will be given by the sum of:

- The final examination marks. The final exam will be administered according to the official schedule and it will have both a theoretical and a practical (exercises) part. It will cover units 1 to 10, and 70% of the total grade can be obtained in this exam.
- Continuous assessment of the student in accordance with attitude (see above “Behavior in the classroom”), participation in class and tests or tasks developed such as: exercises, concept maps and presentations. In this respect, 30% of the total grade can be gained with this part of the continuous assessment.

**Important:** in order to get a passing grade at the end of the term, **the student should pass the final exam**, independently of the marks gotten in the continuous assessment.

**In summary, the grading scheme is as follows:**

**Continuous assessment: 30%**

**Final (scheduled) exam: 70%**

The sum of all the weighted previous marks will be the final grade achieved. Students will pass the course if they obtain 5 out of 10 points. In case of not passing the final exam, the maximum grade will be 4.5.

If a student is suspected of or caught cheating on any test or assignment, he/she will receive a grade of zero.

[https://www.uv.es/graus/normatives/2017\\_108\\_Reglament\\_avaluacio\\_qualificacio.pdf](https://www.uv.es/graus/normatives/2017_108_Reglament_avaluacio_qualificacio.pdf)

The students who do not pass the course in the first call will have the opportunity to be evaluated in a second call with the same evaluation and weighting criteria as in the first one.



## REFERENCES

### Basic

- Navarro, E. (2019): Matemáticas de las operaciones financieras. Ediciones Pirámide. Madrid.
- Zima, P. and R.L. Brown (1996): Schaums outline of theory and practice of Mathematics of Finance, 2nd Edition. McGraw-Hill, New York. [S 51 ZIM]

### Additional

- Baquero, M.J. y Maestro, M.L. (2003): Problemas Resueltos de Matemática de las Operaciones Financieras. Editorial AC. Madrid.
- De Pablo, A. (1998): Matemáticas de las operaciones financieras, Tomo I, Tercera Edición, Editorial UNED. Madrid.
- De Pablo, A. (1998): Matemáticas de las operaciones financieras, Tomo II, Tercera Edición, Editorial UNED. Madrid.
- Meneu, V., Jordá, M.P. y Barreira, M.T. (1994): Operaciones financieras en el mercado español. Editorial Ariel Economía. Barcelona.
- Navarro, E. y Nave, J.M. (2001): Fundamentos de Matemáticas Financieras. Antoni Bosch Editor. Barcelona.
- Dalton, B. (2008): Financial products: an introduction using mathematics and Excel, Cambridge University Press. [S i336 DAL]

## ADDENDUM COVID-19

**This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council**

### 1. Contents

There are no changes respect to the Course Guide.

### 2. Workload

There are no changes respect to the Course Guide.

### 3. Teaching Methodology

The modality of classes for students will depend on the social and health conditions and the restrictions established by the competent authorities.



In the case of **online teaching**, classes will be given by videoconference, preferably synchronous, using Blackboard Collaborate, Teams, Skype or the tool that the lecturer considers appropriate to optimize the student's teaching-learning process during the scheduled program sessions, **which remain the same days and times**.

In the case of **blended teaching**, the students will have to access the classroom in alternate weeks according to the initial of their last name (A-M or L-Z). The classes will be broadcast so that the students will have face-to-face teaching one week, and the next week they will follow the classes in streaming.

#### 4. Evaluation

There are no changes respect to the Course Guide.

#### 5. References

There are no changes respect to the Course Guide.

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